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# Fiscal Deficits, Monetary Reform, and Inflation Stabilization in Romania

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*Fiscal problems are a key factor behind the inflation that has persisted in Eastern Europe since 1989. Deficits need to be cut back, but by how much for a given inflation target? A simple framework links debt, the deficit, and inflation to assess the fiscal stance of the Romanian economy*

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## Summary findings

Unsustainable fiscal deficits were the chief reason for the inflation that has persisted in Eastern Europe since 1989. Deficits need to be cut back, but by how much for a given inflation target?

Budina and van Wijnbergen develop a simple framework for debt, the deficit, and inflation to study the interactions between fiscal and monetary policy in Romania's economy. This framework can be used to 1) determine the financeable deficit and the required deficit reduction for a given rate of output growth, inflation rate, and target for debt-output ratios, and 2) to find the inflation rate for which no fiscal adjustment is needed.

They use this framework to assess consistency between inflation, monetary reform, and fiscal policy in Romania. Many of the issues in Romania are similar to those in other countries. But Romania is an interesting case because of its history of unsuccessful stabilization attempts.

The authors' results suggest that fiscal problems during 1992–94 were masked by shifting government expenses to the books of the National Bank of Romania so that the government deficit did not fully reflect public spending. In addition, the effects of delayed fiscal adjustment were mitigated by exchange rate overvaluation and favorable debt dynamics. In the late 1990s, however, debt dynamics worsened and the economy experienced significant real depreciation. That exacerbated the fiscal problems and increased the fiscal adjustment needed to restore consistency.


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This paper — a product of Macroeconomics and Growth, Development Research Group — is part of a larger effort in the group to study transition economies. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Nina Budina, room MC3-353, telephone 202-458-2045, fax 202-522-3518, email address nbudina@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. The authors may be contacted at nbudina@worldbank.org and svw.heas@wxs.nl. March 2000. (33 pages)

# FISCAL DEFICITS, MONETARY REFORM AND INFLATION STABILIZATION IN ROMANIA

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## INTRODUCTION

Initial decline in economic activity and sharp inflation increases are well-documented stylized facts of transition economy from Central and Eastern Europe and Former Soviet Union.[1] Blanchard (1997) discusses the causes of the initial drop in economic activity and the so-called u-shaped pattern of real GDP growth in 5 transition economies. Deep drops in output and large inflation increases occurred independently of fiscal and exchange rate policies adopted.

Changes in economic structures, caused by transition process itself was accompanied with large primary fiscal imbalances throughout the region: tax revenues drop dramatically in early 1990s because of a decrease in both tax revenues and tax bases. Although there was a substantial cut in government expenditures (most notable subsidies and public investment), social expenditures have increased, so total expenditure cut did not match drop in tax revenues. In early 1990s, resulting budget deficits were financed primarily through direct central bank credit to the government at bellow market interest rates[2] which resulted in accelerated money growth and inflation increases in addition to the initial price liberalization shocks. Budina and van Wijnbergen (1997) discuss the role of fiscal policy in transition process and stress on the negative impact of unsustainable fiscal policies on inflation and macroeconomic stabilization. Our paper draws on the theoretical findings of Sargent and Wallace (1981) Buiter (1985) Drasen and Helpman (1990), Blanchard (1993), Van Wijnbergen (1991) Kawai and Maccini (1995) about fiscal roots of inflation and researches the implications of fiscal policy sustainability for inflation stabilization in Romania. Many of the issues in Romania are familiar for other countries as well.[3] Romania, however, is an interesting example on its own right, because it has by now a history of unsuccessful inflation stabilization attempts.

Following Anand, R. and van Wijnbergen (1989), and van Wijnbergen (1990) we develop a simple framework on debt, deficit and inflation to study the fiscal and monetary policy interactions for the Romanian economy. We apply this framework to assess consistency between inflation, monetary reform and fiscal policy for the Romanian economy.

A central aim of this framework is to derive a measure of medium term consistency between fiscal and monetary policy, the required deficit reduction, representing the difference between funding requirements and funding sources, given the target debt-output ratios and the real output growth rates. We discuss the medium term impact of real exchange rate depreciation and delayed fiscal adjustment on our measure of fiscal sustainability.

We also discuss and show the importance of using a proper definition of the public sector when calculating public sector deficit. Instead of concentrating on the central government budget deficit, we use the general government budget, including all the local governments' budgets and the extra-budgetary accounts, which might conceal a significant part of the government expenditures. Furthermore, we are still missing a very important part of the public sector expenditures and revenues, such as, quasi-fiscal deficit accumulated in the Central Bank. Although familiar from other countries, this issue was especially acute in Romania and we show the impact of using different concepts of public sector deficits on the consistency between monetary and fiscal policies in Romania. This part of the public sector is especially important for the countries experiencing severe fiscal restraints since the governments are tempted to shift some of their fiscal expenditures to the Central Bank balance sheets.

A key design feature of this framework is parsimonious data requirements, for obvious reasons. A second necessary feature is the ability to capture the type of monetary reform transition economies are going through; otherwise much of the analysis would suffer from structural instability. The only econometrics required is the estimation of some components of money demand, which is becoming possible for most countries. The focus is on medium run consistency given a variety of macroeconomic policy objectives. In the model the primary deficit is taken to be a policy parameter. Debt management is summarized by targets for the debt to GDP ratio for both foreign and domestic debt. Implicit in this approach is the view that lenders will impose such a constraint because potential tax revenues, the ultimate source from which debt will need to be serviced, are obviously limited as a share of GDP. Base money growth, for any given inflation target, is endogenously determined by the path of the primary

deficit, debt policy, the real interest rate, the financial structure and the real GDP growth rate. The model is designed to indicate whether any given inflation (money growth) target is consistent with the other policy parameters and structural characteristics of the economy; alternatively, consistency can be imposed which yields the inflation rate consistent with structural stability, other policy variables and the financial structure of the economy.

In what follows, Section 2 presents the analytical framework for assessing the link between inflation and fiscal deficits. Section 3 elaborates on calculation of the public sector deficit for the Romanian economy. The results of estimated asset demand equations are presented in Section 4. In Section 5 the model is put together and applied to a series of policy issues, most of which have been mentioned in the preceding paragraphs. The last section concludes.

## 2 AN ANALYTICAL FRAMEWORK

Fiscal problems are widely recognized as a key factor behind persistent inflation in Eastern Europe post-1989. But little has been said beyond these generalities. Deficits need to be cut back, but how far for a given inflation target? What are the effects of a shifting financial structure, the external debt management or the exchange rate policy on the link between deficits and inflation? Establishing a framework for answering these questions faces special problems in Eastern Europe because post-reform data are short and pre-reform series difficult to use given the radical changes in the economic structure. Therefore, in this study we do not intend to determine how big the optimal deficit should be.

A starting point of the analysis is government budget constraint[4]:

$$D + iB_{-1} + iDC^{g}_{-1} - iDEP^{g}_{-1} + ((1+\hat{E})(1+i^{*})-1)B^{*}_{-1}E_{-1} = \\ = \Delta B + \Delta(B^{*}E) + \Delta DC^{g} - \Delta DEP^{g} \qquad (1)$$

On the left are the funding requirements: the public sector primary deficit $D$ plus the interest payments on the domestic debt $iB$ plus interest payments on domestic credit to the government $iDC^{g}$ minus interest payments on government deposits at the Central Bank $iDEP^{g}$ and plus interest payments on foreign debt, expressed in terms of domestic currency; on the right are the financing sources: domestic debt issue $\Delta$B, foreign borrowing $\Delta$B*E[5], changes in domestic credit to the government $\Delta DC^{g}$ minus changes in government deposits held in the Central Bank $\Delta DEP^{g}$. $E$ is the nominal exchange rate, $i$ is the nominal domestic interest rate, $i^{*}$ is the foreign nominal interest rate. Because valuation changes due to exchange rate changes do not have any impact on the government budget deficit as conventionally recorded[6] we can rewrite (1) as:

$$D + iB_{-1} + iDC^{g}_{-1} - iDEP^{g}_{-1} + (1+\hat{E})i^{*}B^{*}_{-1}E_{-1} = \\ = \Delta B + \Delta B^{*}E_{-1} + \Delta B^{*}\Delta E + \Delta DC^{g} - \Delta DEP^{g} \qquad (2)$$

Note, that Romanian National Bank, NBR, is the main fiscal agent of the government and therefore

its profit and loss account should be included in total public sector budget. This part of the public sector is especially important for the countries facing severe fiscal restraints. The governments of such countries are tempted to shift part of their fiscal expenditures to the Central Bank.[7] Therefore, it is necessary to incorporate the Central Bank's profit and loss account into our measure of public sector deficit (cf Anand and van Wijnbergen (1989))[8]. Analagously to eq. (2), we can rewrite the Central Bank profit and loss account as[9]:

$$\begin{aligned} & i DC^g_{-1} - i DEP^g_{-1} + i C^p_{-1} + (1+\hat{E}) i^* NFA^*_{-1} E_{-1} = \\ & = \Delta DC^g - \Delta DEP^g + E_{-1} \Delta NFA^* + \Delta E \Delta NFA^* - \Delta M + \Delta C^p \end{aligned} \tag{3}$$

Now note that as in the case of the government budget constraint, valuation changes due to changes in nominal exchange rate do not affect the Central Bank′ s profit and loss accounts, because the exchange rate effect is canceled out. We added up general government balance and Central Bank profit and loss account to obtain total public sector budget constraint:[10]

$$\begin{aligned} & D + i B_{-1} - i C^p_{-1} + (1 + \hat{E}) i^* (B^*_{-1} - NFA^*_{-1}) E_{-1} = \\ & = \Delta B + E_{-1} (\Delta B^* - \Delta NFA^*) + \Delta E (\Delta B^* - \Delta NFA^*) + \Delta M - \Delta C^p \end{aligned} \tag{4}$$

The integration of the Central Bank requires two changes in our framework: First, we switch to a net concept of foreign debt, foreign debt minus net foreign assets of the Central Bank. Second, we find that the Central Bank credit to the government, $DC^g$ and the government deposits held at the Central Bank $DEP^g$ disappear when the Central Bank's account is integrated with those of the Government, since it is just a claim of one public entity on another.With debt policy defined in terms of target debt output ratios, real increases in debt are tied to the growth rate of real GDP, $n$:

$$\begin{aligned} & \Delta (B / P) = n (B / P) \\ & \Delta \left( \frac{(B^* - NFA) E}{P} \right) = n \left( \frac{(B^* - NFA) E}{P} \right) \end{aligned} \tag{5}$$

$\Delta$ indicates the absolute change in the expression that follows (like a dot above a single variable). $Y$

stands for real GDP. Dividing eq. 9 by $P$ (the domestic price level) and using some standard definitions[11], we obtain a measure of the real integrated general government and Central Bank budget constraint:

$$d + \frac{(i - \pi)}{(1 + \pi)} b_{-1} \quad \frac{(i - \pi)}{(1 + \pi)} c^{p}_{-1} + (1 + \hat{e}) \frac{(i^{*} - \pi^{*})}{(1 + \pi^{*})} e_{-1}(b^{*} - nfa^{*}) =$$
$$= \Delta b + (1 + \hat{e}) e_{-1}(\Delta b^{*} - \Delta nfa^{*}) + \Delta m + \frac{\pi}{(1 + \pi)} m_{-1} - \Delta c^{p} \qquad (6)$$

where lower case letter denote real variables, corresponding to the nominal variables from the previous equations. Subtracting the right from the left hand side of eq.10, dividing by real GDP, and defining a debt policy in terms of target debt output ratios where real debt increases are tied to the growth rate of GDP, we obtain the measure for the required deficit reduction expressed as a percentage of GDP:

$$rdr = [d + r(b - c^{p}) + (r^{*} + \hat{e})(b^{*} - nfa^{*})e]$$
$$[nb + n(b^{*} - nfa^{*})e + (n + \pi)m - \Delta c^{p}] \qquad (7)$$

where $r$ and $r^{*}$ stand for domestic and foreign real interest rates, respectively, and $e$ is the real exchange rate $P/(EP^{*})$. Lower case variants of variables already defined as upper case indicate the corresponding ratios to GDP. For example, $b$ is the ratio of domestic debt to GDP, $B/(PY)$. The first term between square brackets represents the actual public sector deficit, inclusive of real interest payments on domestic and (net) foreign debt. The second term states the financeable deficit using the two constraints for the growth rate of the domestic and foreign debt (which should not grow faster than the growth of the real resources available for its servicing) plus the resources collected through the increase in the monetary base (seigniorage), minus the real credit to non-public sector over GDP ratio. $n$ is the real growth rate of the economy and $\pi$ the target inflation rate. Therefore, $(n+\pi)m$ equals the real value of the nominal increase in base money, $\Delta M/P$.

Seigniorage revenues $(n + \pi)m$ in turn are a function of the inflation rate, reserve requirements, liquidity requirements and asset demands[12]. $(n+\pi)m$ equals the real value of the

nominal increase in base money, ΔM/P. The monetary base m equals all interest free net public sector liabilities - i.e. currency in circulation and commercial bank reserves held in the Central Bank minus any claim the Central Bank has on the non-government sector. Under a fractional reserve system, the demand for base money equals:

$$\frac{M_0}{PY} = \frac{Cu}{PY} + \sum_{i=1}^{s} RR_{D_i} \frac{D_i}{PY} \qquad (8)$$

$M_0$ is the monetary base, $P$ is the price level and $Y$ is real income (GDP). $Di$ are commercial bank deposits against which reserves have to be held at the Central Bank. $RR_{Di}$ are the reserve requirements against these deposits respectively. $Cu$ is currency in circulation. To evaluate the monetary base as a function of the variables mentioned we have used a portfolio choice model of the demand for Currency, $Cu$, demand for demand deposits $DD$, Savings deposits $SD$, and Foreign currency deposits $FD$[13]. In standard portfolio theory fashion, these asset demands are a function of interest rates on savings deposits, inflation and nominal exchange rate depreciation:

$$\frac{A_i}{PY} = f_i(\pi, i_{TD}, \dot{E}) \qquad (9)$$

where $Ai$ for i from 1 to 4 are CU, DD, SD, and FD. We have used a simple financial sector model (eq.8) incorporating reserve requirements, and other bank regulatory policies to derive demand for banks reserves. The total demand for base money is then equal to:

$$\frac{M_0}{PY} = f_{CU}(\pi, i_{TD}, \dot{E}) + \sum_{i=1}^{s} RR_{D_i} f_{D_i}(\pi, i_{TD}, \dot{E}) \qquad (10)$$

and it is used to calculate the seigniorage revenues for different inflation rates, real output growth rates, interest rates, and for different regulatory policies.

Finally, estimated seigniorage revenues is expressed as a function of inflation, real growth and interest rates and reserve requirements[14]:

$$SR = (\pi + n)\frac{M_0 f(\pi, i_{TD}, i_{FD}, RR_{D_i}, i_{RR_{Di}})}{PY} \qquad (11)$$

## 3. ROMANIAN PUBLIC SECTOR DEFICIT

Initial fiscal crises were common at the beginning of transition. Unsustainable fiscal deficits financed by a rapid (mostly) foreign debt accumulation was an important obstacle for successful macroeconomic stabilization. There were substantial differences between early and late reformers across the region. Budina and van Wijnbergen (1997) provide a comparison between pre- and post-transition tax revenues and expenditures for Romania and Poland which actually highlights the degree of initial fiscal crisis in Romania. Table 1 shows tax and expenditures structure of the Romanian budget before and just after transition process was initiated.

**Table 1 Fiscal Expenditures and Revenue changes in Romania**

| **Budget Expenditure** | **Pre (1989)** | **Post(1993)** |
|---|---|---|
| Total Expenditures | 42.7 | 31.0 |
| Investment | 17.6 | 3.9 |
| Goods & services/wages & salaries | 9.8 | 11.4 |
| Subsidies | 0.4 | 5.5 |
| Social Outlays | 9.5 | 8.9 |
| Other | 5.4 | 1.3 |
| **Budget Revenues** | **Pre (1989)** | **Post(1993)** |
| Total Revenues | 51.1 | 30.9 |
| Tax Revenues | 33.2 | 29.7 |
| Corporate Taxes | 6.3 | 3.5 |
| Individual Taxes | na | 6 |
| Domestic Taxes on Goods and Services | 18.9 | 7.4 |
| International Trade Taxes | 0.0 | 1.4 |
| Social Security Taxes | 6.8 | 8.5 |
| Other Tax and Non-Tax Revenue | 19.1 | 4.1 |

**Source: EBRD Transition Report 1994**

As shown in the table, the main expenditure cut comes from a dramatic drop in public investment (from 17.6 to 3.9 percent of GDP). Direct subsidies increased substantially immediately after transition (from 0.4 to 5.5 percent of GDP).

As table 1 shows, there were significant changes in tax revenues at the beginning of transition as well. First, turnover tax was replaced by VAT with flat rate 18 percent, but typically there were numerous VAT tax exemptions (especially for the agricultural and energy sectors). The wage tax had an extremely inefficient structure: it had 15 different tax rates with a marginal tax rate of 60 percent. Low tax collection rate, inefficient revenue structure (in part because of delays with introducing a personal income tax), numerous VAT exemptions, tax evasion and economic decline resulted in a shrinking tax base which exacerbated current and future fiscal problems.

In addition, Romania was channeling extensive indirect subsidies to targeted sectors (e.g. agriculture, energy) through low-interest central bank loans extended and often never repaid by commercial banks. These indirect subsidies had a direct inflationary impact in what they directly contributed to the increase of monetary base. These subsidies, however, were not appearing on government books because they were not accounted for as government expenditures which implies that primary deficit as reported may be significantly understated.

As we will show later, looking only at government balances is therefore bound to give us a distorted picture of public sector liabilities. The framework we are using, on the other hand, overcomes this problem, because it treats both the government and the Central bank as one public sector entity and provides an elegant link between public sector deficit and inflation given medium term debt management and exchange rate policy objectives and economic growth.

We now use the framework outlined in section 2 to estimate actual public sector deficit for 1992 – 1994 which will be used as a benchmark in the next section to assess the sustainability of the Romanian economy. We first calculate nominal deficits of the general government, Central Bank, and then we aggregate them to obtain the total nominal public sector deficit. There are three points to bear in mind: First, we note that, when calculating the total public sector deficit, we exclude the liabilities of one public entity onto another, since they cancel out each other. Second, we are only interested in the net debt concept, the difference between general government foreign liabilities and

the Central Bank's net foreign assets. Third, in countries with large changes of inflation and exchange rate, valuation effects might be substantial. Therefore we have to single out the changes due to quantity and to valuation effects (due to inflation and exchange rate changes)[15].

The second step consists of calculating the real general government, Central Bank quasi-fiscal deficit, and aggregated public sector deficit as a percentage of GDP. These deficits are calculated by excluding the inflationary component of all public sector liabilities, except for the change in money financing from the nominal deficits[16]. The real NBR quasi-fiscal deficit is accumulated either through an increase of the NBR's foreign currency liabilities or through the base money increase (e.g. direct NBR credit to the government, commercial banks refinancing or extending low interest rate credits to the agricultural and energy sectors).[17]

**Table 2. Romania: Nominal and Real Public Sector Deficit, 1992-1994**

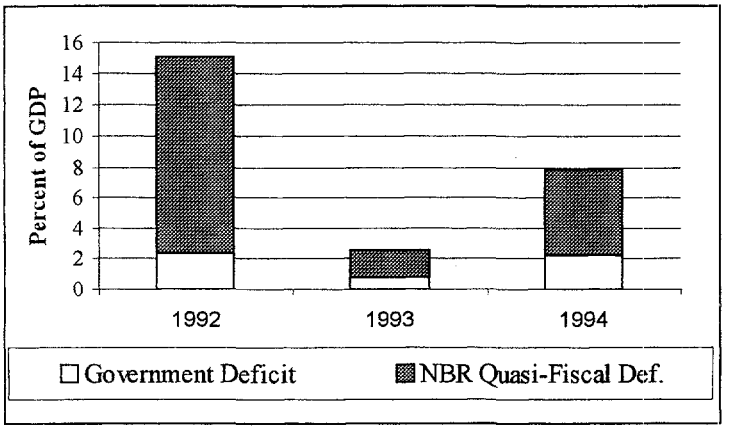
| | NOMINAL | | | REAL | | |
|---|---|---|---|---|---|---|
| | 1992 | 1993 | 1994 | 1992 | 1993 | 1994 |
| **DEFICIT (A.+B.+C.)** | **15.11** | **2.55** | **7.89** | **14.02** | **1.49** | **6.59** |
| **A. Money Financing** | *8.40* | *0.62* | *3.31* | *8.39* | *0.62* | *3.31* |
| Base Money | 7.77 | 8.73 | 4.38 | 7.77 | 8.73 | 4.38 |
| *Less* Refinancing Credit | -0.63 | 8.11 | 1.07 | -0.62 | 8.11 | 1.07 |
| **B. Net External Debt Financing *** | *6.00* | *0.87* | *4.34* | *5.47* | *0.85* | *3.29* |
| Gross External Financing | 5.49 | 2.58 | 2.90 | 5.36 | 1.09 | 3.22 |
| *Plus* NFL of the NBK | 0.51 | -1.71 | 1.44 | 0.11 | -0.24 | 0.07 |
| **C. Domestic Debt Financing** | *0.72* | *1.06* | *0.24* | *0.15* | *0.02* | *0.00* |
| **D. Change in Government Deposits at NBR (net)** | *3.89* | *2.80* | *0.86* | *-0.05* | *-0.14* | *0.00* |
| **Memo:** | | | | | | |
| General Government Deficit | 2.32 | 0.84 | 2.28 | 5.55 | 1.26 | 3.22 |
| NBR Quasi-fiscal Deficit | 12.80 | 1.71 | 5.61 | 5.55 | 1.26 | 3.22 |
| GDP (in USD billion) | 13005 | 14761 | 27355.9 | | | |
| Nominal exchange rate, Lei/1USD | 460 | 1276 | 1767 | | | |
| CPI Inflation, e.o.p. % | 198 | 296 | 62 | | | |

*Note*: The components of financing refer to changes in stocks (i.e., end-of-year stocks less beginning-of-year stocks).
See Annex 2 for details on calculation of the total public sector deficit in Romania
*Cross effects are included in the net foreign financing

The NBR quasi-fiscal deficit is accumulated through extending cheap credits or implicit subsidies (at below market interest rates) to the government and to particular economic sectors either by printing money or through foreign borrowing(increase of NBR's NFL liabilities).[18] Table 1 shows our calculations for nominal and real public sector deficit in Romania.

Figure 1 and Figure 2 represent nominal and real public sector deficits during 1992 – 1994. As we can see from the figures, quasi-fiscal deficit did have at least the size of government deficit except in 1993.

Figure 1 Nominal Public Sector Deficit: Government and NBR Deficit

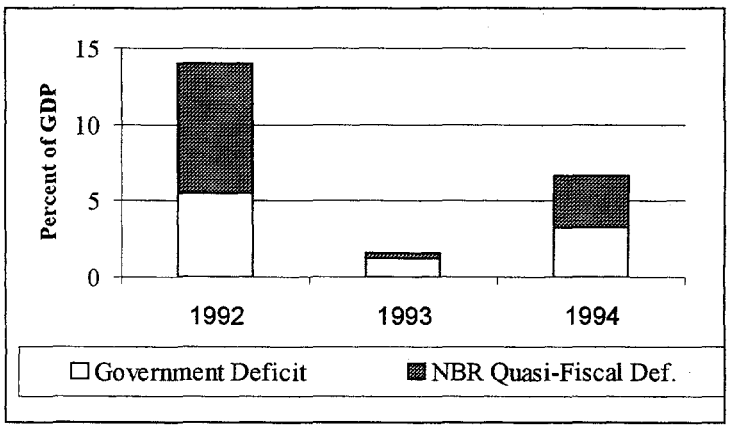



The bulk of quasi-fiscal deficit was financed through money creation, and hence a direct explanation for triple digit inflation rates in 1992 and 1993. The revenue from money creation, however, decreased from 8.4 percent in 1992 down to 3.31 percent in 1994 which is to be expected given the rates of inflation in 1992 and 1993.[19] Note that seigniorage revenue is the same for both nominal and real public sector deficit because not only real component of seigniorage, but also the inflation tax are used to finance public sector liabilities by the real resources of the economic agents.

The next significant item in the public sector deficit is net external financing. As we already discussed, total public deficit requires a switch from gross to net external debt concept, therefore, we sum up government and Central bank net foreign liabilities. The bulk of net foreign financing is

external debt accumulation. Indeed, Romania started its economic reforms with a very low level of external indebtedness. However; it did not restructure initial fiscal imbalances, but instead was using a combination of money creation and foreign debt accumulation to finance its government and quasi-fiscal deficits. This worsened significantly its repayment prospects in the medium term. As the figure 1 shows, the quasi-fiscal deficit is a substantial share in the total consolidated deficit during the whole period 1992 –1994 and as IMF estimates indicate was a problem thereafter. A reason for these large quasi-fiscal deficits has been the indirect subsidies to the agricultural and the energy sectors. Therefore, using only the general government deficit figure can show a distorted picture of the fiscal stance in Romania.

Figure 2 Real Public Sector Deficit: Government and NBR Deficit




In section 4 we illustrate the importance of the proper measure of real public sector deficit for assessing the consistency between monetary and fiscal policies for Romania.

Finally, we have computed the net Central Bank liabilities, as money financing minus domestic credit to the government and the net foreign assets.

## 4 ESTIMATION OF ASSET DEMANDS FOR THE ROMANIAN ECONOMY

Following Anand and van Wijnbergen (1989) we specify a portfolio choice model for the Romanian economy. We specify demand functions for various financial assets that are assumed to depend on deposit interest rates and inflation:

$$\ln(\frac{A_i}{PY}) = \alpha_i - \beta_{j,i} \ln(1 + x_{j,i})$$

Where $\ln(A_i/PY)$ represents the demand for various financial assets to GDP ratios, (i = 4): demand for currency in circulation, demand deposits, savings deposits and foreign currency deposits.[20] Various financial asset demands are regressed on a constant term, $\alpha_i$ and opportunity cost variables $x_{j,i}$, with corresponding elasticities, $\beta_{j,i}$. The opportunity cost variables used in our regressions are nominal interest rate on savings deposits, CPI inflation rate and the rate of nominal exchange rate depreciation. We used quarterly data for the period 1990:IQ – 1996:IIQ.

To avoid spurious regression, we first checked the order of integration of individual time series. All the series are integrated of order one, which means that their first differences are stationary. Because all the variables are integrated of the same order, there is an indication that a long-run relation between them exist.

We applied a one-step ECM estimation by regressing the first difference of each dependent variable on lagged dependent and independent variables, on first difference of the independent variables, on constants, dummies and time trends in some cases.[21]

$$\Delta\left[\ln(\frac{A_{j,i}}{PY})\right] = \lambda_i\left[\ln(\frac{A_{j,i}}{PY})\right]_{t-1} + \delta_{j,i}\left[\ln(1 + x_{j,i})\right]_{t-1} + \gamma_{j,i}\Delta\left[\ln(1 + x_{j,i})\right] + \eta_i + Dummies$$

Where $\lambda_i$ is referred as an error-correction term or adjustment coefficient[22], and $\theta_{j,i} = \delta_{j,i}/\lambda_i$ are long-run multipliers that represent long-run relation between estimated variables and represent the long-run effect on asset demands of a change in explanatory variables; $\gamma_{j,i}$ are the impact

multipliers and measure the immediate (short-run) effect of explanatory variables on asset demands. Dummy variables account for price liberalization at the beginning of 1991, and a dummy equal to 1 after 1992.IIIQ to account for a sharp increase in foreign currency deposits. i=1,..,4 represent the financial assets demand equations: demand for currency, demand deposits, savings deposits, and foreign currency deposits, and j is the number of explanatory variables in each equation.

Table A.1 presents the one-step ECM estimations of various financial asset demands for the Polish economy, for the period 1990.IIQ – 1996.IIQ. Table A.2 presents the Wald test for cointegration as shown in Boswijk (1994). The four columns in table A.1 present the estimated ECM equations for demand for currency, demand deposits, savings deposits and foreign currency deposits. All the estimated equations except the demand deposits equation for the whole sample passed the test for stationarity[23] which allows us to find the long-run demand for financial assets for the Romanian economy.

The estimated long-run coefficients for the interest variables have the expected signs: a negative impact of savings deposit interest rates on currency in circulation and demand deposits and a negative impact of inflation rate on savings deposits. Exchange rate depreciation enters positively in the demand for foreign currency deposits, which reflects currency substitution at play in response to nominal depreciation. However, we found out that nominal interest rate on savings deposits does not enter the long run demand for savings deposits, only the changes in interest rate have a short-term impact on the changes in demand for savings deposits. This suggests that domestic interest rates still do not act as indirect instruments of monetary policy implementation. Inflationary expectations of the economic agents have a dominant role in determining demand for savings deposits. For the foreign currency deposits we observe the phenomena of currency substitution[24], which is determined by the positive sign of the exchange rate depreciation coefficient. In comparison with the other two countries of Bulgaria and Poland, we note that although this coefficient

has the correct sign, it is not significant. However, we have found a very significant and positive coefficient of the D923=1 after 1992.3, when the foreign currency deposits have increased sharply. One explanation for these coefficients can be the removal of particular foreign currency restrictions that have prevented the economic agents to replace domestic assets with foreign assets. For the case of demand for time deposits, the liberalization dummy, DUM, has positive and very significant coefficients as well. The DUM is a dummy variable that captures the effect of a series of measures initiated in the first quarter of 1991, the most important of which are price and foreign trade liberalization, a huge nominal exchange rate devaluation, connected with the removal of the multiple exchange rate system, and the introduction of restrictive money supply measures such as the raising of nominal interest rates.

## 5 INFLATION AND CONSISTENCY OF FISCAL POLICY IN ROMANIA

In this section we apply the framework outlined in section 2 and assess fiscal sustainability of the Romanian economy. Romania is a very interesting example of a transition economy, because it had relatively favorable initial conditions at the onset of the reform process. Nevertheless, Romania had a sequence of unsuccessful stabilization attempts. In this section, we present our fiscal sustainability calculations and the obstacles for achievement consistency between monetary and fiscal policy. Fiscal sustainability requires that debt to GDP ratio does not grow faster than growth adjusted real interest rate.[25] Blanchard (1993) suggests a set of indicators which can be used when assessing fiscal sustainability in a country: 'primary gap' which does not require any projections, 'medium-term tax gap which does requires some projections of government expenditures and transfers, and average primary gap(averaging over current and future time intervals). The 'medium-term tax gap' requires detailed projections of government expenditures and transfers. In our framework, however, we do assume that primary deficit is a policy parameter so we do not enter in detailed government expenditure projections.

The first indicator, so-called "primary gap" is the simplest one and does not require any forecasts. Buiter (1985, 1996) employed this simple indicator of sustainability to developed and transition economies. Budina and van Wijnbergen (1997) calculated sustainable primary deficits in 16 transition economies, based on three main assumptions: first, debt management policy targets are summarized as constant debt to GDP ratios (assumed to be equal to current debt- to –GDP ratios); second, they make simulations for 1 and 5 percent growth adjusted long run interest rate (See Buiter, 1995); third, they do make assumption that at least in medium term, governments are able to extract on average 2 percent of GDP as revenue from seigniorage (See Budina and van Wijnbergen for further details).

In assessing fiscal sustainability in Romania, one faces a specific problem, namely that the primary deficit does not fully reflect total public sector expenditures in the Romanian economy. Indeed, if we assume target debt to GDP ratio of 20%, growth augmented real interest rate of 5 percent, and long run seigniorage revenue of 1.29 percent of GDP, we arrive at sustainable primary deficit at about 0.3 percent of GDP. For more optimistic case of 1 percent growth augmented interest rate we obtain a sustainable primary deficit of 1.09 percent of GDP. During1992 – 1996 primary deficits were much above 2 percent of GDP and only since 1997 there was an effort to reduce them and even run primary surpluses.

To summarize, the primary gap measure showed that Romanian fiscal policy is unsustainable even if not accounting for quasi-fiscal deficits of the Central Bank. The framework we apply bellow has the advantage in that it gives us a consolidated measure of the public sector deficit (government and the quasi-fiscal deficit of the central bank). As we have shown already in section 3, quasi-fiscal deficit is substantial and often larger than the general government budget deficit.

### 5.1 Inflation and Revenue from Money Creation

In this section, we discuss the impact of inflation rate on financial asset demands, the

monetary base, and revenue from seigniorage. Seigniorage revenues are derived as a function of the inflation rate, reserve requirements, liquidity requirements and estimated financial asset demands. The monetary base equals all interest-free net public sector liabilities to the private sector. These liabilities are currency in circulation and commercial bank reserves held in the Central Bank minus any claim the bank has on the non-government sector.

Table 3 shows the Laffer curve shape of inflation tax and revenue from seigniorage. The table gives us the estimated financial asset demands, monetary base, inflation tax and seigniorage revenue for a given inflation rate. We have used 1994 as a base year in our simulation model.

**Table 3 Estimated Asset demands, Inflation tax and Seigniorage revenues**

| Inflation Rate | Demand for: | | | | Inflation Tax | Seigniorage Revenue |
|---|---|---|---|---|---|---|
| | Currency | Deposits | | | | |
| | | Demand | Savings | Foreign currency | | |
| 0 | 6.60 | 7.92 | 19.71 | 3.72 | 0.01 | 0.29 |
| 10 | 5.85 | 6.85 | 15.53 | 3.74 | 0.74 | 1.00 |
| 62 | 3.58 | 3.79 | 5.91 | 3.83 | 2.13 | 2.32 |
| 100 | 2.74 | 2.74 | 3.48 | 3.88 | 2.30 | 2.46 |
| 110 | 2.57 | 2.55 | 3.08 | 3.89 | 2.31 | 2.47 |
| 160 | 1.96 | 1.84 | 1.81 | 3.94 | 2.25 | 2.39 |
| 200 | 1.64 | 1.47 | 1.26 | 3.98 | 2.15 | 2.28 |

Inflation tax is obtained as a product of inflation rate and the estimated ratio of base money to GDP. We show the inflation tax and seigniorage revenue for an inflation range from 0 to 250 percent. The aim is to demonstrate the limit which the public sets on revenue from money creation, determined by long-run elasticities of demand for various financial assets w.r.t. opportunity cost variables (interest rates and inflation).

The underlying assumptions here are: a 62 percent inflation rate (actual in 1994), 8 percent minimum reserve requirements for reserves held in domestic currency; 16 percent minimum reserve

requirements for reserves held in foreign currency; 15 percent interest rate on reserves denominated in domestic currency and 3 percent on reserves denominated in foreign currency; a real output growth rate of 3 percent; 2 percent foreign inflation rate; and zero real exchange rate devaluation. Maximum long-run revenue from inflation (inflation tax and seigniorage) is 2.31 and 2.47 percent of GDP, respectively. The maximizing inflation rate is estimated at about 110 percent. Any increase of the expected inflation rate beyond this level would result in both lower seigniorage and lower inflation tax as shown in table 3.

### 5.2 Fiscal Situation in Romania in 1994

In this section we illustrate the impact of using the two different measures of real fiscal deficit (general government budget and total public sector deficit) to assess the consistency between monetary and fiscal policies for the Romanian economy.

Table 4 presents inflation rate, financeable deficit(deficit that is consistent with all the assumptions and policy targets), and our measure of fiscal inconsistency (which is analogous to 'primary gap' in Blanchard 1993, because it calculates the difference between funding sources(actual deficit) and funding requirements (financeable deficit), but it looks not only at the primary deficit, but on consolidated public sector deficit(including quasi-fiscal deficit of the central bank).

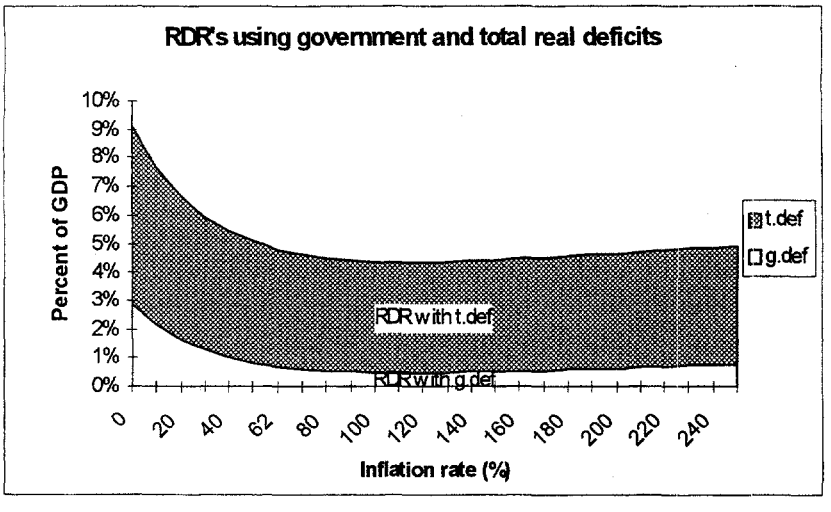
**Table 4 Financeable deficit and required deficit reduction for various inflation rates.**

| Inflation rate | Financeable Deficit | Required Deficit Reduction | |
|---|---|---|---|
| | | General government deficit (3.22 %) | Public sector deficit (6.59 %) |
| 0 | 0.26 | 2.96 | 6.33 |
| 10 | 1.03 | 2.19 | 5.56 |
| 62 | 2.50 | 0.72 | 4.09 |
| 110 | 2.70 | 0.52 | 3.89 |
| 160 | 2.64 | 0.58 | 3.95 |
| 200 | 2.55 | 0.67 | 4.04 |

The first column indicates financeable deficit for various inflation rates. The second column presents the RDR measure when using the general real government deficit measure. When we use conventional measure of general government budget deficit, 3.22 percent of GDP in 1994, for 1994 actual rate of inflation 62 percent, fiscal inconsistency, rdr, is estimated at 0.72 percent of the GDP, which given prevailing real interest and growth rate does not reveal severe fiscal problems.

The last column shows the fiscal inconsistency measure, rdr, when actual deficit is calculated as consolidated real public sector deficit (including quasi-fiscal deficit of the Central Bank). For real public sector deficit of 6.59 percent of GDP in 1994, fiscal adjustment, necessary to restore sustainability, rdr, at 62 percent inflation rate amounts to about 4 percent of GDP! The lowest value of RDR is achieved at a 110 percent inflation rate and does not reach zero for any inflation rate. As the last column of table 4 shows, RDR is positive for the whole range of inflation rates, or there is no inflation rate that can close the gap between financeable and actual deficit.

Figure 3 Required Deficit Reduction for Government and Total Public Sector Deficit




This result shows that the current fiscal policy is unsustainable in the medium run given our assumptions about real growth rate and public debt to GDP ratio. This is an important result for the case of the Romanian economy and illustrates the importance of using the quasi-fiscal deficit that

incorporates the total assets and liabilities of the public sector. It supports the theories about fiscal roots of high and persistent inflation, since it reveals present, but hidden fiscal inconsistencies and will cause future inflationary pressures.

### 5.3 The impact of real exchange rate depreciation

The cost of servicing foreign debt also depends on the real exchange rate developments. Therefore, we can analyze the impact of varying real exchange rate depreciation on foreign debt servicing costs and thus on rdr, our measure of fiscal inconsistency. We use as a benchmark real exchange rate peg in base year, and then we simulate the impact of real depreciation and appreciation of domestic currency. During 1992-1994, Lei was considerably overvalued, but the situation changed in late 1990s.

Table 5 presents the impact of varying the rate of real exchange rate depreciation from 0 (the base case) to 5 and then to 10 percent. It can be seen from the table that any positive rate of the real exchange rate depreciation will only raise the required deficit measure for all the inflation rates and thus worsen the consistency problems. At zero inflation rate and subsequent increase of the real exchange rate depreciation from 0 to 5 and then to 10 percent, the RDR measure will rise from 6.36 to 7.11 and to 7.86 percent of GDP respectively. Thus, capital losses on foreign debt associated with any positive real exchange rate depreciation can complicate fiscal adjustment.

We also assess the impact of real exchange rate appreciation on the consistency between inflation and fiscal deficits. This impact is seen through a comparison of the second column of table 5, which shows the rdr measure for 10 percent real appreciation, and the third column, which shows the rdr for our base case scenario with constant real exchange rate. The result is a decline of the rdr, our measure of fiscal inconsistency for the whole inflation range. The reason for this seemingly improved fiscal stance is that such a policy of real exchange rate appreciation can decrease the foreign debt

burden (there will be capital gains on foreign debt). However, running large deficits combined with an overvalued currency on a sustained basis can bring about large current account deficits, a depletion of foreign exchange reserves and therefore currency crises that can bring forward a fiscal crisis as well.

**Table 5 The impact of real exchange rate changes**

| Inflation rate | RDR with a real appreciation e= - 10 % | RDR with a real exchange rate depreciation | | |
|---|---|---|---|---|
| | | e=0 % (Base case) | e=5 % | e=10 % |
| 0 | 6.21 | 6.36 | 7.11 | 7.86 |
| 62 | 3.97 | 4.12 | 4.87 | 5.62 |
| 110 | 3.78 | 3.93 | 4.68 | 5.43 |
| 160 | 3.83 | 3.98 | 4.73 | 5.48 |
| 200 | 3.92 | 4.07 | 4.82 | 5.57 |

### 5.4 The impact of delayed fiscal adjustment

In this section we use assess the impact of delayed fiscal adjustment in a medium term. In this simulation we assume that the gap between funding requirements and funding sources is financed by additional debt accumulation rather than fiscal adjustment for 6 years. We then compare the measure of fiscal inconsistency, rdr, as of 1994 and 6 years later. As one might expect, the difference between real interest rate on debt and real growth rate is crucial for debt dynamics and for future fiscal inconsistency (rdr after 6 years) respectively.

Table 6 presents the impact of the delayed fiscal adjustment for base year 1994 real GDP growth rate, 3 percent, and for a more optimistic assumption of 5 percent real GDP growth rate. Here we would like to illustrate that the debt accumulation process crucially depends on the difference between the real interest rate and the real growth rate. Whenever the real interest exceeds the growth rate, as it does in the base case, delaying the required deficit reduction translates into a greater adjustment problem later (first two columns of Table 6). At 62 percent inflation rate in 1994, if the government

postpones the necessary fiscal adjustment for 6 years, at the end, the cumulative measure of RDR for this six year period will rise from 4.12 to 4.64 percent of GDP.

**Table 6 The impact of higher output growth and a delayed fiscal adjustment**

| Inflation rate | Required Deficit Reduction | | | |
|---|---|---|---|---|
| | n=3 % (Base case growth rate) | | n=5 % (Simulation) | |
| | now | after 6 years | Now | after 6 years |
| 0 | 6.36 | 7.16 | 6.16 | 6.57 |
| 10 | 5.59 | 6.30 | 5.41 | 5.81 |
| 62 | 4.12 | 4.64 | 3.98 | 4.28 |
| 110 | 3.93 | 4.42 | 3.81 | 4.08 |
| 160 | 3.98 | 4.48 | 3.88 | 4.13 |
| 200 | 4.07 | 4.59 | 3.98 | 4.24 |

The next two columns show the impact of real growth rate increase from 3 to 5 percent on this cumulative measure. First, such a GDP growth will increase seigniorage revenues and will therefore decrease the RDR at 62 percent from 4.12 to 3.98 percent of GDP (compare the first and third columns). Second, a rise in real GDP growth, other things being equal, will decrease the eventual RDR from 4.64 to 4.28 percent of GDP at the end of the six year period, since the debt policy rule will give more room for the government to run the new debt (compare columns two and four of the table).

In late 1990s, however, Romania experienced economic recession, average growth rate during 1997 - 1999 is negative, -5.8 percent of GDP. Romania also experienced a sharp increase of sovereign debt risk premium which more than doubled interest rate demanded for new debt. Consequently, the difference between real interest rate and real growth rate increased substantially which altered debt dynamics and have adversely affected Romania's fiscal position. As a result, Romania today is forced to make much larger and more painful fiscal adjustment to return on the sustainable path.

## CONCLUSIONS

We applied a simple framework to analyze the link between inflation and fiscal deficits for the Romanian economy. This framework may be used in two ways: 1). to derive financeable deficit and the Required Deficit Reduction (representing the difference between funding requirements and funding sources) for given output growth rate, inflation rate and target debt-output ratios, and 2). to obtain the equilibrium inflation rate for which no fiscal adjustment needs to occur.

The main factor behind high and persistent inflation rates and frequent exchange rate crises in Romania since 1991 were unsustainable fiscal deficits. In assessing fiscal sustainability in Romania, one faces a specific problem, namely that the government deficit does not fully reflect total public sector expenditures in the Romanian economy.

Quasi-fiscal deficits existed because a large part of subsidies to the agriculture and energy sectors, as well as support to troubled banks, was given by the NBR in the form of loans extended on very favorable terms. This shows that there is a shift of subsidies or other government expenditures to the books of the central bank and that the actual fiscal policy has not changed significantly. These NBR indirect subsidies were usually so big that the total public-sector was twice as large as the general government deficit. As a result, monetary policy has been inherently accommodating depending on any deterioration of the financial situation in these sectors thus causing permanent inflationary pressures.

We used both government budget deficit, and total public sector deficit (incorporating all public sector assets and liabilities, including Central Bank profit and loss accounts) when assessing fiscal sustainability in Romania. When we use as a benchmark the real general government budget deficit, fiscal inconsistencies appear to be very small. Inflation performance may suggest that there is no link between fiscal policy and inflation, because despite small fiscal inconsistencies, inflation was very high (62 percent in 1994). This seemingly puzzling result disappears once we use the total real public sector deficit in our model.

These two experiments illustrate the importance of the fact that in transition economies, a large part of public sector liabilities are often switched to the Central Banks. The gap between funding requirements and funding sources at 62 percent inflation rate in 1994 was 4 percent of GDP! This reveals large fiscal inconsistencies – in fact, there is no inflation rate at which fiscal inconsistency can be eliminated!

Fiscal problems during 1992-1994 were masked through shifting government expenses to the books of the NBR and were supported in addition, by the policy of overvalued exchange rate and very favorable debt dynamics (relatively high real growth rates and favorable interest rates). Fiscal adjustment was delayed and first serious attempts were made in 1997 – 1999. By then, however, the cost of fiscal adjustment increased significantly because of worsened debt dynamics and significant real exchange rate depreciation which increased the debt burden and necessary fiscal adjustment even further.

Real exchange rate depreciation is increasing the foreign debt burden and therefore the gap between the actual and the financeable deficit. Real exchange rate appreciation, on the other hand is decreasing the *rdr*, our measure of inconsistency. However, any prolonged period of an overvalued domestic currency will put pressure on the external balance and will cause large discrete depreciations in the face of depleting foreign exchange reserves which will further complicate fiscal management.

Any delay in fiscal corrections in the face of weak growth recovering prospects and fast debt accumulation will only increase the gap between actual and financeable deficit. Besides prudent fiscal strategy, which is essential for any macro economic stabilization an important policy recommendation is to increase the transparency of its public sector balances and account for all public sector expenditures in the budget.

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## ANNEX 1 VARIABLES DEFINITION AND ESTIMATION RESULTS

Every variable can be expressed in the following way:

$$\frac{\Delta Y}{P} = \Delta y + \frac{\pi}{1+\pi} y_1$$

where y denotes any of the variables. This equation says that the change in the nominal variable over the price level is equal to the change in the real variable and the inflationary component.

Furthermore, we have used well known expressions that link the current domestic and foreign price levels, price levels of one period past, the real exchange rate, and the exchange rate depreciation:

$$P = (1+\pi)P_1 \qquad e = \frac{EP^*}{P} \qquad (1+\hat{e}) = \frac{(1+\hat{E})(1+\pi^*)}{(1+P)}$$

*Data description*

The data source for money demand estimates are IFS and NBR annual, quarterly, and monthly bulletins. The observation period includes 1990.1 - 1996.1, on a quarterly basis. *Money assets* are classified as:

CU currency in circulation (bln Lei)
DD demand deposits (bln Lei)
HD savings deposits (bln Lei)
FD foreign currency deposits.(bln Lei)
IAD annualized interest rate on savings deposits, end of the quarter
FI1 London official rate on 1 month dollar time deposits
YIN calculated on basis of monthly average of 1989=100
EXR nominal exchange rate, Lei per USD, end of the quarter
CPI Consumer price index, end of the quarter, 1990=100
Dum=1 for 1991.1 accounting for initial price and foreign trade liberalization
Dum=1 after 1992.1 accounting for implementation of more restrictive monetary policy measures (raising of the nominal interest rates in the economy)

*Variables definition*

LAjY=Log(Aj/CPI)-Log(YIN), where Aj is CU, DD, HD, and FD
P=Log(UCPI/UCPI(-1)), AP=4*P, annualized CPI inflation
E=Log(EXR/EXR(-1)), AE=12*E annualized exchange rate devaluation
LIAD=Log(1+IAD/100) nominal savings deposits' interest rate

**Table A.1 ECM Estimates of a financial sector portfolio model for the Romanian economy.**

| *Explanatory Variables* | **D(LCUY)** | **D(LDDY)** | **D(LHDY)** | **D(LFDY)** |
|---|---|---|---|---|
| Constant | 4.06 | 2.29 | 1.10 | 2.59 |
| | (2.92) | (2.59) | (3.19) | (3.69) |
| DUM, equal to one in 1991.IQ to measure the impact of price liberalization | - 0.22 | 1.13 | | |
| | (-1.76) | (3.31) | | |
| LIAD(-1)=log(1+$i_{deposits}$), nominal interest rate on savings deposits | - 0.76 | - 0.54 | | |
| | (- 1.81) | (-1.25) | | |
| D(LIAD)=dlog(1+$i_{deposits}$), first difference of nominal deposits interest rate | - 0.82 | - 0.21 | 0.65 | |
| | (-1.27) | (-0.17) | (1.12) | |
| AP CPI inflation | | | - 0.33 | |
| | | | (-4.85) | |
| D(AP), changes in CPI inflation | | | - 0.27 | |
| | | | (-3.45) | |
| AE(-1), nominal exchange rate depreciation | | | | 0.033 |
| | | | | (0.43) |
| D(AE), changes in nominal exchange rate depreciation | | | | 0.05 |
| | | | | (1.07) |
| D923, dummy equal to 1 after 1992.IIIQ and zero otherwise | | | | 0.65 |
| | | | | (2.96) |
| $LA_jY(-1)$, one lag of log of corresponding financial assets to GDP ratio | - 0.59 | - 0.35 | - 0.13 | - 0.53 |
| | (-2.93) | (-2.62) | (-2.69) | (-3.55) |
| $R^2$ | 0.33 | 0.49 | 0.65 | 0.42 |
| DW | 1.78 | 1.98 | 1.72 | 1.31 |

* For the first equation we have used dummy=1 for 1991.1, to account for price liberalization in the beginning of the reforms.

**For the second equation (demand for demand deposits), we have used dummy q =1 for 1992.1 restrictive monetary policy implementation.

*** For the last equation (demand for foreign currency deposits), we have used dummy=1 after 1992.3 to account for a sharp rise in these deposits.

****t-statistics are given in brackets under the estimates.

**Table A.2 Wald tests for $H_0$ being 'non – cointegration' hypothesis**

| | **D(LCUY)** | **D(LDDY)** | **D(LHDY)** | **D(LFDY)** |
|---|---|---|---|---|
| N, number of restrictions | 2 | 2 | 2 | 2 |
| F-statistics | 8.599 | 6.839 | 7.255 | 12.603 |
| | (0.0079) | (0.0161) | (0.0139) | (0.0020) |
| Chi-square | 8.599 | 6.833 | 7.255 | 12.603 |
| | (0.0033) | (0.0089) | (0.0070) | (0.0003) |
| $\xi=nF$ | 17.198 | 13.678 | 14.51 | 25.2 |

*The critical values are taken from Boswijk (1994) and are for 0.1 significance level.

## ANNEX 2 EXTRACTING FOREIGN AND DOMESTIC FINANCING

*A2.1 Calculation of Nominal Foreign Financing*

The change in the value of Net Foreign Liabilities (NFL) of the NBR can be due to the change in quantity of foreign financing as well as exchange rate changes that result in capital gains or losses. When calculating the change in NFL, however, we are interested in quantity rather than valuation effects. The divisi[1]on of the two effects is done on a month-by-month basis:

$$\Delta G = G - G_{-1} \qquad (A.1)$$

Eq.A.1 represents the total monthly change in gold holdings, including the quantity effect and capital gains or losses, resulting from the change in gold prices.

Eq. A.2 represents the quantity effect of the change in the value of gold, which is equal to the change in the quantity of the gold, times the NBR price of gold one period ago:

$$\Delta G^q = (G - G_{-1}) Pg_{-1} \qquad (A.2)$$

$$\Delta G^v = G_1(Pg - Pg_{-1}) \qquad (A.3)$$

Eq. A.3 and A.4 represent the valuation and cross effects:

$$\Delta G^c = (G - G_{-1})(Pg - Pg_{-1}) \qquad (A.4)$$

In an analogous way, we have calculated these effects for the rest of the net foreign liabilities:

- Dollar NFL equals to the dollar liabilities ("Deposits of the BIS") minus the dollar assets (NBR's foreign exchange holdings). Here we have used the end of the month nominal exchange rate (Lei per 1 USD).
- SDR NFL are just equal to the SDR liabilities ("Use of Fund Resources"), since there are no assets here. We have used the internal NBR SDR rate (Lei per 1 SDR) as well.

*A2.2 Real Quasi-Fiscal Deficit calculation*

Therefore, all changes in public sector liabilities are broken down into real and inflationary components:

$$\frac{\Delta G}{P_t} = \left(\frac{\Delta G}{P_t}\right) \frac{\pi}{1 + \pi}\left(\frac{G_{t-1}}{P_{t-1}}\right)$$

where G is any asset (liability) of the NBR or the general government. The second term from the RHS of the above expression is subtracted when calculating the final figure for the deficit, except for the base money financing, since the inflation tax also provides real resources for the deficit financing. When calculating Net foreign liabilities of the government and the NBR, valuation changes caused by exchange rate changes and the foreign inflation component are also subtracted (we have used the real exchange rate for the final figure of the deficit). This decomposition of the change in liabilities is also made on a month-by-month basis, and the total yearly change is obtained as a sum of the monthly changes to avoid inflationary distortions.

To derive the operational measure of the deficit for the Romanian economy, we have used the balance sheet of the National Bank of Romania (NBR). There are two sources of financing which could be extracted from the balance sheet of the NBR: money financing, accounting for the NBR refinancing credit to the commercial banks and foreign financing. Domestic financing is obtained from the aggregate balance sheet of the commercial banks, since the commercial banking sector was the main source of domestic financing for the public sector within Romania. As for the net foreign government liabilities, we have used an approximation from the world debt tables.

*Money financing* As discussed in Anand and van Wijnbergen (1989), the proper definition of monetary base is that which consists of all net interest free liabilities of the Central Bank to the non-public sector, which is the sum of currency in circulation and the commercial banks' required reserves held in the central bank, net of Central Bank refinancing to the commercial banking system[26]:

$$M_0 = Cu + RR\ Cp$$

*Foreign financing* The Net Foreign Liabilities (NFL) consist of three primary categories: dollar denominated liabilities ("Deposits of BIS") and assets (NBR's foreign exchange holdings); SDR denominated liabilities ("Use of Fund Resources"; there are no SDR assets); and gold holdings (assets side)[27].

*Domestic financing* The last item we extract from the NBR Balance sheet is domestic financing. As Anand and van Wijnbergen (1989) pointed out, the source of domestic financing in Romanian is the commercial banking sector[28].

## ANNEX 3 BASE YEAR PARAMETERS OF THE SIMULATION MODEL

| Table A.3 | 1992 | 1993 | 1994 |
|---|---|---|---|
| $\pi$, end of the year inflation rate, % | 198 | 296 | 62 |
| n, real GDP growth rate, % | -13.6 | 1 | 3 |
| $\mu$, base money growth | 77.17 | 86.04 | 62.9 |
| RM/DEP, Effective Reserve requirements, % | 40.81 | 27.9 | 22.41 |
| M0/y, adjusted for the end of year inflation% | 9.75 | 6.73 | 5.61 |
| $\pi$M0/y, Inflation tax, %of GDP | 11.07 | 8.53 | 4.83 |
| SR/Y, Gross seigniorage as % of GDP | 7.77 | 8.73 | 4.38 |
| SRA/Y, Seigniorage, net of refinancing, % | 8.4 | 0.62 | 3.31 |
| Real CU/GDP | 3.9% | 2.8% | 3.6% |
| Real DD/GDP | 5.9% | 3.2% | 3.8% |
| Real TD/GDP | 0.8% | 0.8% | 5.5% |
| Real SD/GDP | 4.04% | 1.7% | 1.3% |
| Real FD/GDP | 3.22% | 3.5% | 3.8% |
| Time deposits' interest rate | 33% | 71.5% | 47.4% |
| Forex deposits' interest rate | 3.68% | 3.3% | 6.1% |
| Interest on reserves in Lei | | 15% | 15% |
| Interest on reserves in foreign currency | | 3% | 3% |
| Reserve requirements on Lei deposits | | 8% | 8% |
| Reserve requirements on forex deposits | | 0% | 16% |
| Real GDP growth rate (EBRD est) | -13.6% | 1% | 3% |
| Foreign debt interest rate | 7% | 5% | 5% |
| Nominal Government NFL ($ bn) | 2354 | 3111 | 4121 |
| Nominal GDP (Lei bn) | 5982300 | 18835000 | 48338000 |
| GDP in $ bn | 13005 | 14760.9 | 27355.9 |
| Real foreign debt to GDP ratio | 18.1% | 21.1% | 15.1% |
| Real interest rate on domestic debt | -41.9% | -56% | -0.6% |
| Real domestic debt to GDP ratio | 0.42% | 0.65% | 0.46% |
| Real total deficit to GDP ratio | 14.02% | 1.49% | 6.59% |

## ENDNOTES

[1] See Balcerowicz (1993), Bruno (1993), Blanchard (1994, 1997), van Wijnbergen (1994) amd Sahay and Vegh (1995a,b,c) and Budina and van Wijnbergen (1997).

[2] Note that in early 1990s domestic debt markets were virtually non-existent or in a very rudimentary form, whereas foreign financing was very limited or soon ceased to be an option in some countries.

[3] See Budina (1997), Budina and van Wijnbergen (1997) and van Wijnbergen and Budina (1999) and World Bank (1999) for analyses of fiscal sustainability and inflation for the case of Bulgaria, Poland and the Kyrgyz Republic.

[4] To capture all the public sector assets and liabilities, we define the government budget as central and local governments budget, including extra-budgetary accounts which gives us the consolidated government budget constraint.

[5] Analogously, changes in value of the government foreign liabilities can be broken down into quantity and valuation components, and the cross-product term $\Delta B^* \Delta E$ of second order:

$$\Delta(B^* E) = E_{-1}\Delta B^* + B^*_{-1}\Delta E + \Delta B^* \Delta E$$

the first term on the RHS represents the change in stock of foreign debt, the second term represents exchange rate changes, and the last term is just the cross product.

[6] Any increase of interest costs on foreign debt due to nominal exchange rate changes will be capitalized and results in a higher stock of foreign debt expressed in domestic currency.

[7] . An important example is when foreign debt interest payments are switched to the Central Bank without being accounted for in the government budget.

[8] The Central Bank' s profit and loss account can be derived by using the Central Bank balance sheet:

$$\Delta M - \Delta C^p = \Delta DC^g - \Delta DEP^g + \Delta NFA\, E - \Delta NW$$

The left hand side represents the change in net interest free Central Bank liabilities to the private sector, $\Delta M$, which is equal to the change in currency in circulation plus the change in required reserves held by commercial banks at the Central Bank minus the change in refinancing credit to the commercial banking sector, $\Delta C^p$. The right hand side represents the change in the Central Bank's assets, net of its profits (change in its net worth, $\Delta NW$); The change in domestic credit extended to the government, $\Delta DC^g$ less the change in government deposits held in the Central Bank, $\Delta DEP^g$ plus change in Central Bank's Net Foreign Assets (or liabilities with the opposite sign), $\Delta NFAE$. The Central Bank profits consist of interest earnings on its net credits (refinancing and credit to the government), $iDC$, plus interest earnings on its foreign assets (or alternatively minus interest expenditures on its net foreign liabilities), $iNFA$:

$$i\,DC^g_{-1} - i\,DEP^g_{-1} + i\,C^p_{-1} + ((1+i^*)(1+\hat{E})-1)\,NFA^*_{-1}E_{-1} = \Delta NW$$

Combining the above equations gives us the Central Bank=s profit and loss account:

$$i\,DC^g_{-1} - DEP^g_{-1} + i\,C^p_{-1} + ((1+i^*)(1+\hat{E})-1)\,NFA^*_{-1}E_{-1} =$$
$$= \Delta DC^g - \Delta DEP^g + \Delta(NFA^* E) - \Delta M + \Delta C^p$$

[9] .Note that the changes in interest earnings on the Central Bank Net Foreign assets due to the exchange rate changes (LHS) will result in the same changes in the Net Foreign Assets (RHS), so they will cancel out. We also take into account that the change in the value of NFA, expressed in domestic currency, can be due to the change in the dollar value of NFA, change in the exchange rate, or the cross effect of the two.

[10] See Budina N., and S. van Wijnbergen (1995)

[11] . See Annex 3

[12] . See Anand, R. and S. van Wijnbergen (1987)

[13] .Typically, such portfolio choice models include demand for government bonds as well. However, in the case of economies in transition, bond financing is relatively new phenomena and the secondary market of government bonds is either non-existent or in a very rudimentary state.

[14] Note, that in this way the model allows for different statutory reserve requirements on different types of deposits, which in turn might depend on their sensitivity w.r.t. interest rates and inflation.

[15] In this case, all calculations have to be done on a month-by-month basis, in order to exclude the monthly valuation effects. The yearly quantity effect, in which we are interested, is obtained by summing up the monthly quantity effects.

[16] See Annex 2

[17] Most of these credits were non-performing and this has deteriorated the commercial banks' portfolios. They have

been officially recognized as a government debt later in order to clean commercial banks' portfolios.

[18] Base money growth can be divided by two components: inflation tax and the growth of real base money. The inflationary component could be compared, as a tax levied to the economic agents in order to finance the public sector deficit and therefore, the inflationary component of the monetary financing should not be excluded. See Buiter (1985), Anand and van Wijnbergen (1988), and Balino, T. and V. Sundararajan (1994).

[19] Inflation rate acts like a tax on real money balances the economic agents are willing to hold, the hire the rate of inflation, the lower the demand for real money balances, so above certain level this may lead to actual drop in seigniorage revenues. In addition, a change in the degree of currency substitution (the agents are substituting their real balances in foreign currencies as a hedge against inflation) can impose a lower limit of the maximum amount of seigniorage revenue which the government is able to extract from the public. See van Aarle and Budina (1996).

[20] Note, that we expressed various asset demands as a share of income, assuming a unitary elasticity of income. The income furthermore is approximated by the index of real industrial production which was the only scale indicator available on a quarterly basis.

[21] Boswijk and van Dijk (1996) suggested the following algorithm:

i. Choose the proper lagged structure of the variables

ii. Specify the following equation:

$\Delta y_t = \lambda\, y_{t-1} + \delta z_{t-1} + \delta_0 \Delta z_t + \eta_t$

iii. The unit root test is equivalent to a Wald test on $\lambda=0$ and $\delta=0$

iv. The above equation is equivalent to:

$\Delta y_t = \lambda\, (y_{t-1} - \theta z_{t-1}) + \delta_0 \Delta z_t + \eta_t$

Where $\theta = -\delta/\lambda$ and is interpreted as the long-run value of the variable coefficient, and the t-statistics of $\delta$ can be used as a test for its significance. This basic equation can be extended by adding a constant, linear trend and lagged differences of dependent or independent variables.

[22] The model is said to be stable if $-2<\lambda<0$ . See Boswijk (1996) for a further detail.

[23] We rejected the null hypothesis of 'no-cointegration' for time and savings deposits and for foreign currency deposits at 10 % level of significance, and at 20 % for demand for currency.

[24].Van Aarle and Budina (1996) provide empirical evidence for the currency substitution in Eastern Europe. They define currency substitution as substituting domestic with foreign currency for the purpose of store-of-value. Our estimates are consistent with their estimates of currency substitution for foreign currency deposits, the difference being that we have constructed a one-step ECM model and used the most current data available.

[25] Buiter (1985), Blanchard (1990) sustainability requires the following inter-temporal BC to hold:

$$\int d \exp[-(r-n)t]dt = -b_0$$

or that the PV of primary surplus (-d), discounted at (r-n) should be equal to initial value of debt.

[26].We therefore, extract the money financing from the liability side of the balance sheet of the NBR, as the sum of the following items: "currency" and "deposits of future banks" (representing currency in circulation) and "interbanking liabilities" (representing the commercial banks' obligatory reserves, held in the NBR).
To get the net money financing, however, we must subtract the NBR refinancing credit for the commercial banks (Cb).

[27] See Annex 3

[28].The estimate of net domestic financing can therefore be obtained from the aggregate balance sheet of the commercial banks, as a difference between "public debt", or $DC^g$ and "government deposits", or $DEP^g$. The item "public debt" is the net of "public debt by law 7", a result of an exchange of government debt for non-performing loans held by the commercial banks, which thus measures only the credit to the government used for its deficit financing.

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